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MINIMUM DESIRABLE KITCHEN WORKING AND STORAGE SPACE AND EQUIPMENT //

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Of all the tasks needed to run a household, the work carried on in the kitchen is the most time consuming and one of the most vital in importance to the family welfare. A study made by Dr. Hildegard Kneeland some years ago of 1,500 rural and urban homes showed that an average of 51 hours and 40 minutes a week are spent by a woman in home making activities alone, in addition to ten hours a week help from other members of the family and paid workers in the home. Of this time more than half is spent in the kitchen in preparation of food, dishwashing, washing, ironing, and cleaning with an average of 22 hours and fifty minutes a week spent in preparing food and clearing away after meals.

The amount of energy that goes into kitchen tasks is indicated by an Oregon study of the mileage involved in different types of kitchens. The plan that involved the least mileage would require 162 miles per year.

In the light of these figures it is evident that the kitchen should be planned with more, rather than less, care than any other one room in the house. This is especially true for homes of low income families. The entire work of such a household is usually done by one person who too often is not trained to think in terms of efficient equipment for and methods of working. To reduce the fatigue connected with the major household activity by providing adequate and well arranged working facilities and storage space that will result in a working of maximum efficiency, should, therefore, be given first consideration in planning

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a kitchen. Saving time and energy in this way that may be applied to activities of social significance to the family promotes family welfare.

The amount of working and storage space needed varies with the size and composition of the family, their economic background, and their buying and living habits. Urban families with ready access to stores, or with too limited cash to do otherwise, may buy in amounts only sufficient, in general, to meet their daily needs. They will then require less storage space for food than families who buy in larger amounts either as an economy measure or due to their distance from food markets. Storage space needed in a kitchen is therefore more variable than the working space needed for the performance of standard kitchen tasks. In general, rural families require more than urban families of the same size.

The problem of a limited cash budget for the rural woman should be offset by the preservation of home grown foods. This requires increased cold storage space and additional work space as well as storage space for canning utensils, supplies, and canned products. Moreover, in many rural areas facilities are needed for feeding large numbers of people at harvest times. But while minimum standards for urban and rural storage space and equipment differ, there are factors common to both problems.

To be adequate for food service alone, kitchen storage space must include space for food supplies of different kinds; utensils and equipment for preparing and cooking foods, serving-china, glassware, silverware and linen, and dishwashing equipment and supplies. The food storage space must be suitable as well as adequate for perishable foods, staple groceries, canned and packaged goods.

Storage cupboards located above and below the working counters have of late years superseded ~~pantries~~ for storing utensils and food. With this change it is possible to plan a kitchen in terms of working units so equipped that a job can be done in one spot with everything needed for that job within easy reach or with only a step or two required. The different units are so arranged that the sequence of work is in a continuous path without criss-crossing of routes.

With this type of arrangement the sink is located between the work unit, where food is prepared, and the dish storage section. It is also near the range. The food preparation unit may with equal convenience be located either right or left of the sink, but since a right-handed person washes dishes from right to left the natural location for the space for draining and stacking the dishes after washing is to the left of the sink. This is the determining argument for placing the food preparation unit at the right.

The food preparation counter should be large enough for typical food preparation jobs such as rolling out pastry, cookies and biscuits, for kneading bread, and for the equipment used while these processes are going on. For economical use of space it should also be adequate for stacking soiled dishes when being used with the sink as part of the dish-washing work unit. With a counter two feet wide, thirty inches has been found to be the minimum length desirable for these operations for a family of two or three persons. The length should increase for increased sizes of family. (See Table I.)

The amount of surface working space needed at the left of the sink

Table I

MINIMUM AND DESIRABLE STANDARDS FOR WORKING SPACE WITH STORAGE SPACE ABOVE AND BELOW

Arrangement of counters	No. of persons in family	Counter length along front		Total length of counter	Total storage space in sq. ft.	
		Lft. of sink	Rt. of sink		3 shelf wall cab. left of sink	4 shelf wall cab. left of sink
		Minimum Standards				
Urban					Wall cabinets same length as base cab.	
St. line	2 - 3	18"	30"	4'0"	28	
St. line: in broken L, broken U or parallel wall kitchen	4 - 5	30"	36"	5'6"	39	
	6 - 8	30"	36"	5'6"		42
Rural						
St. line: in broken L, broken U or parallel wall kitchen	2 - 3	30"	36"	5'6"	39	
	4 - 5	30"	36"	5'6"		42
St. line in broken L kitchen	6 - 8	36"	26"	6'0"		46
Desirable Standards						
Urban						
St. line	2 - 3	24"	30"	4'6"	32	
St. line: in broken L, broken U or parallel wall kitchen	4 - 5	30"	36"	6'0"		42
	6 - 8	30"	42"	6'0"		46
Window at side					Wall cab. shorter than base to allow for windows	
L Type	6 - 8	30"	18"x24"	6'0"		50
L Type	6 - 8	24"x18"	42"	7'0"		56

Table I (continued)

Arrangement of counters	No. of persons in family	Counter length		Total length of counter	Total storage space in sq. ft.	
		Lft. of sink	along front Rt. of sink		3 shelf wall cab. left of sink	4 shelf wall cab. left of sink
Rural						
Window at side and over sink						
L Type In L or broken U kitchen	2 - 5	base 36" wall 30"	18"x24" 36"	6'6" 5'6"		51
L Type In L or broken U kitchen	2 - 5	base 24"x18" wall 36"	42" 36"	7'0"	53	
L Type	6 - 8	base 36" wall 30"	18"x30" 36"	7'0" 5'6"		
L Type	6 - 8	base 24"x18" wall 36"	48" 42"	7'6" 6'6"	57	

depends upon whether or not the counter is used for draining dishes, and if so, upon the quantity of dishes to be washed. With a single bowl sink, if the dishes are few in number and can easily be placed directly on the shelves without extra steps, this space need be only large enough to provide for a dish drainer i.e.: 18 inches. For large families or in cases where more dishes are involved, additional space should be provided for stacking the dishes as wiped. This cuts down the motions involved in the clearing up process. (See Table I.)

The work space at the left of the sink, in a small kitchen planned for good routing, either adjoins or is near the stove and should, therefore, be large enough to be used also as a serving counter when preparing meals.

The minimum length of counter on either side of the sink varies with the type of kitchen arrangement. For example, a counter 30 inches long in a straight line type of arrangement should be increased in front length to turn the corner in an L type of arrangement so as to provide at least 18 inches on each side of the bend. This takes care of standing room in the bend of the counter. Increasing the 18 inches to 24 inches on one side of the bend is desirable, since it makes more accessible the storage space in the corner produced by the L arrangement.

In the modern kitchen adequate storage space for food preparation utensils and supplies in daily use such as seasonings, packaged goods and staple groceries is provided above and below the mixing counter. Storage space for utensils used at the range should be provided near the sink and range.

The most efficient storage space for dishes, dish towels, linen, and silver is as near as possible to both the dish draining counter and the dining table. Dish washing supplies such as soaps, soap powder, dish cloths and towels, and equipment such as dishpans, drain pans or racks, and garbage cans should be near the sink, either underneath it or at one side. Additional storage space for dishes may be secured by shelves over the sink, when this space is not occupied by windows, as is usually the case in multiple dwellings. These shelves must either be narrow or placed high enough above the sink to avoid creating an obstruction. A height of 24 inches above the sink top for the lowest shelf 12 inches wide, makes two reachable shelves possible.

Storage space under working counters is provided by drawers and cupboards. The best width for base storage cabinets is 24 inches. The counter should project beyond the edge of the cabinet a sufficient amount to avoid spilled foods dripping down the front and into drawers. Base cabinets should always be covered both as a dust preventive and to reduce the work involved in keeping the contents of the cupboards in place, since small children playing in the kitchen are prone to pull the contents of open cupboards out to use as playthings.

A base cabinet with a shallow drawer immediately below the counter top and a cupboard with one adjustable shelf provides more square feet of storage space than a cabinet made up entirely of drawers or one with a cupboard below two drawers. With such a cabinet allowing $3/4$ " for thickness of cabinet walls, 5" for the loss in width and 8" for the loss in reachable length of drawer space, there is on an average about 4.6

square feet of base cabinet storage space for each foot of cabinet length.

The best width for wall shelves above a counter is 11 inches. This is adequate for dinner plates of average size, but wide platters will have to be accommodated elsewhere. This width will also suffice for most packaged goods and all but the largest mixing bowls needed at the food preparation center. For low cost housing open wall shelves are usually provided in the interest of economy. In dusty regions close fitting doors or window-shade coverings that can be drawn down are advisable. Wall cabinets 12" deep overall having three reachable shelves, with $3/4$ " allowed for wall thickness, provide on an average 2.6 square feet of storage space for each foot of cabinet length, or a total above and below of 7.2 square feet of storage space for each foot length of cabinet.

The height of large food containers requires greater distance between shelves above the food preparation counter than is necessary for shelves on the left side that are used for dish storage. Four reachable shelves may be possible in the latter case, if pitchers are stored elsewhere and platters or plates are not stood on edge. Three reachable shelves are the maximum usually feasible on the food storage side.

The amount of reachable wall shelf storage space secured is related to the height of base cabinets and the space between the working counter and lowest shelf above it. Home Economists are agreed on a range of from 32 to 36 inches as desirable heights of the base cabinet, the variation being due to differences in heights of workers. An Oregon study gives 32 inches as the desirable height for a food mixing surface.

In selecting the height for the shelves above the working counter,

one should consider the effect of height on the reachability of the shelves, the amount of working surface visible, the height of articles that may be stored at the back of the counter and the psychological effect on the worker of the obstruction caused by the wall cabinet. The reachability of the shelves is the point that has been emphasized most frequently.

An intervening space of 12 inches has been suggested as a minimum for providing desired reachability of shelves above a counter 34 inches high. The Oregon study reported 14" desirable between the mixing table 32 inches high and the shelves when the latter extended the entire length of the counter. The lowest shelf in this case would be at the same height as in the case mentioned above. To secure unobstructed working area, a space of 15 to 18 inches between counters and wall cabinets is generally advocated. The higher space is advisable only when storage of tall articles at the back of the counter is desired or in cases of a psychological reaction to the obstruction caused by low shelves above a working surface.

The usual storage space for perishable foods is a refrigerator, but in some sections of the country a ventilated closet or "cooler cupboard" may be substituted in rural dwellings. In either case, for maximum efficiency in preparing foods it should be located as near the mixing counter as possible. This may be at the right end of the counter or across from it.

The storage capacity needed for perishable foods varies, as stated above, with the buying habits. For rural use some space may also be needed for keeping marketable goods fresh. The amount of refrigeration

needed also depends on whether cellars or, possibly, community facilities are available. The minimum capacities suggested in the following table are based on limitations due to costs of refrigerators. Considering the savings effected by buying in larger quantities the difference in cost between a small and more adequate refrigerator may be more than balanced, however, in a comparatively short time.

Table II

Minimum and desirable standards for refrigerator

No. of Persons in Family	Capacity in Cubic Feet			
	Minimum		Desirable	
	Urban	Rural	Urban	Rural
2 - 3	4	5	5	6
4 - 5	5	6	6	8
6 - 8	6	8	8	10 - 12

In general it is recommended that the capacity of the refrigerator be increased 1 cubic foot for every two additional persons.

There is a wide variation in the outside dimensions of refrigerators of the same storage capacity, due to differences in manufacturers' designs. To prevent limitation in the choice of a refrigerator sufficient space must, therefore, be allotted in a kitchen plan to provide for some leeway in dimensions of the cabinet used. Some allowance in width must also be included to provide for moving the refrigerator into and out of its regular position in case of needed repairs. The following Table III based on the dimensions of 1941 models includes allowances as suggested above.

Table III

Dimensions Recommended for Kitchen Space Allowance
To Meet the Requirements for
Refrigerators of Different Types

Type of Refrigerators	Food Storage Capacity in Cubic Feet	Width in Inches	Depth in Inches
Ice	4	30	24
	5	33	24
	6	33	25
	7	35	26
	8 - 9	45	27
	10 - 12	45	32
Kerosene	5	40	29
	6	40	29
	7	45	30
	8 - 9	45	30
	10 - 11	48	32
Gas	4	27	28
	5	28	29
	6	33	29
	7	35	29
	8 - 9	36	30
	10 - 12	48	31
Electric	4	27	27
	5	27	28
	6	33	28
	7	33	28
	8 - 9	36	29
	10 - 12	45	32

A ventilated or cooler cupboard for perishable foods requires two outside vents, one at or below the floor level and the other at the top of the cupboard. For best ventilation it should be built into a corner of the kitchen. The vents when open should be covered with fine mesh copper screening, which can be removed for cleaning. Arrangement should be provided for closing them, when desirable, from the inside. The door must be tight fitting, but the shelves should be as open as possible to provide for maximum ventilation. A closet 22"x22" with 6 or 7 slatted shelves is adequate for the farm family.

Space for storage of small supplies of canned goods or for utensils that are not in constant demand may be provided by shelves built over the refrigerator. The reachability and number of shelves possible varies with the height and type of refrigerator used. Shelves over a modern ice refrigerator may be built close to the top of the cabinet without interfering with the operation of the refrigerator, if an inch or two is allowed for moving the refrigerator in and out of place. To provide for needed circulation of air around mechanical refrigerators of different types, the following space should be left between the top of the cabinet and the first shelf above it.

Electric - at least 6 inches and preferably 12 inches.

Kerosene and gas - at least 12 inches unless connected
with an outside vent.

The amounts of canned goods stored differs so with family habits that it is impossible to make any statement concerning the amount of storage space needed. For rural families extra storage space must be

provided outside the kitchen. On the basis of Maud Wilson's study of shelf space needed for different sized containers and an Indiana study of the average amounts of canned goods stored by rural families, 63 feet of shelving 12 inches wide with shelves 9 inches apart is needed for home canned foods, and 14 feet with shelves 12 to 18 inches apart for food in tin cans. With a ceiling 7' 3" high this requires a wall space 9 to 10 feet wide. A closet 4'x4' with shelves on 3 sides would be adequate.

Shelving Needed for Canned Goods

Article	How Stored	Amt. of 12" Wide shelving per 100 containers	Height Between shelves in inches
Half gallon jars	2 rows to shelf	20 ft.	11-1/2 - 12-1/2
Quart & Pint "	2 rows to shelf	19 ft.	9 - 9-1/2
Jelly glasses, tall	2 deep; 3 rows to shelf	4 ft. 10"	10
Jelly glasses, squat	3 deep; 3 rows to shelf	3 ft. 2"	11
Pint glass bottles	3 rows to shelf	9 ft.	14
Tin cans, #10	2 rows to shelf	28 ft. 8"	9-1/2
Tin cans, #2 $\frac{1}{2}$	2 deep; two rows to shelf	9 ft.	12

Stove and sink dimensions are both related to amounts of working and storage space available. The space needed for the stove depends

upon the kind of fuel used and the type of range chosen. For urban housing the choice usually lies between manufactured gas and electricity. For rural housing the choice is either coal, wood, kerosene, electricity or bottled gas.

Variation in stove length depends upon the number of burners and the size and location of the oven. Gas and electric "apartment type" ranges approximately two feet square with both three and four surface heating elements are available. The location of the oven below the cooking top and under the switch panel saves space but gives less convenient working height than when the oven is located to one side and directly under the range top as in the table top ranges. The lower cost and smaller space requirements of the apartment type range have outweighed the question of desirable oven-working heights for low-cost housing. The additional working and storage space and oven size provided by table top ranges make them desirable for rural and large urban families.

Due to the larger dimensions of coal and wood ranges and the free space needed on all sides, they require 9 or 10 square feet more floor area in a kitchen for a family of 2 to 3 persons than a gas or electric range. In addition to this, storage space for fuel must also be provided near a coal or wood range besides storage facilities for the main supply near the kitchen. For kitchen storage a wood box 2'x2'x2'6" is considered desirable.

Table IV

Minimum Standards Suggested for Ranges (1941 Dimensions)

	No. of Persons in Family	No. of Burners	Size of Oven			Dimensions	
			Width inches	Depth inches	Height inches	Width inches	Depth inches
Manufactured Gas - Urban	2 - 3	3	16	18 - 19	13 - 14	19 - 21	22 - 26
	4 - 5	3	16	19 - 20	13 - 14	29 - 30 35 - 38	22 - 28
	6 - 8	4	16-18	19 - 20	14	38 - 40	24 - 28
Electric - Urban	2 - 3	3	16	18 - 20	14 - 16	19 - 22	24 - 25
	4 - 5	3	16	19 - 20	14 - 16	30 - 38	24 - 25
	6 - 8	4	16-17	19 - 20	14 - 17	38 - 40	24 - 28
Electric - Rural	2 - 3	4	16	18 - 20	14 - 16	19-22-30	24 - 25
	4 - 5	4	16	19 - 20	14 - 16	36 - 38	23 - 25
	6 - 8	4	16-17	19 - 20	14 - 17	38 - 40	24 - 28
Bottled Gas Rural	2 - 3	4	16	18 - 19	13 - 14	19 - 21 29 - 30	22 - 28
	4 - 5	4	16	19 - 20	13 - 14	35 - 38	22 - 28
	6 - 8	4	16-18	19 - 20	14 - 17	38 - 42	24 - 28
Coal or Wood	2 - 3		16-18	17 - 18	10 - 11	37 - 40	22 - 24
	4 - 5		18	17 - 19	11 - 12	42	24 - 27
	6 - 8		19-20	18 - 20	13 - 14	42 - 48	24 - 30

There is a wide choice in the sizes and designs of sinks possible, and in the materials of which they are constructed. Single bowl sinks vary in length from 18 to 36 inches and in width from 12 to 20 inches. Double compartment sinks vary from 32 to 50 inches in length and from 20 to 25 inches in width. Since a double compartment sink needs only two to six more inches than a 30 inch single bowl sink, the determining factor in choice for large families is the question of cost versus convenience.

Depths vary from 6 to 9 inches. The double compartment sinks are usually deeper than single bowl sinks. A depth of 6 inches is sufficient to prevent splashing. A deeper sink makes difficult locating the bottom of the sink high enough for comfort.

Flat-rim sinks are less expensive than roll rim sinks and can easily be built into a counter. When the sink is installed as a separate unit, or at a different height from the adjoining counter, the roll rim type with a back splash and apron is desirable.

Sinks with single or double drain boards require space for additional work counters, since a grooved drainboard does not make a good work surface. Where cost and space are not at a premium, they provide the ideal solution for the problem of having a sink at the right height; i.e. with the bottom 32 inches from the floor. Single drainboard sinks are commonly made 42 or 52 inches long, double drainboard sinks come 72, 74 and 78 inches long.

The materials in most common use for sinks are porcelain enamel on steel or iron, stainless steel and metal alloy. The flat-rim single bowl sink made of porcelain enamel on steel is the least expensive. Shipping

costs are less with steel than with iron as a base due to the lighter weight of steel. While iron is more rigid, the steel base sinks have proved durable.

The adequacy of a sink is measured by its accommodation of the large utensils used in it. Cooking pots in common use range in diameter from five to seven inches for small capacity utensils and from nine to ten inches for large kettles. Household dish pan diameters range from 14 to 16 inches. Since a porcelain enamel sink 24"x16" is the smallest flat rim single bowl sink manufactured by more than one or two firms, it is suggested as the minimum standard size in the table below. The size of sink is increased to agree with the use of larger utensils as the size of family increases. The larger sink also provides room for stacking soiled dishes to relieve congestion where work counters are small.

Table V

Minimum Standards for Sinks for Families of Different Sizes				
No of Persons in Family	Single Compartment Sinks			
	Urban		Rural	
	Length	Depth	Length	Depth
2 - 3	24	16	24	20
4 - 5	24	20	30	18
6 - 8	24	20	30	18

The closet for cleaning supplies belongs preferably just beyond the kitchen door on the way to the outside door. This closet should provide storage for the following articles: Broom, dust pan, carpet sweeper, dust mop, wet mop, two or more pails, brushes and cleaning supplies.

It should contain a cupboard tall enough to hang brooms, mops, and

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Table 1				
Year	1980	1985	1990	1995
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carpet sweeper and if no other place is provided to store the ironing board, step ladder, and table leaves. To supply the needed height, the first shelf should be 67 inches above the floor of the closet. This allows space for 2 shelves for cleaning supplies if the closet reaches to a 7' 3" ceiling.

Minimum Sizes for Cleaning Closets (Inside Measurements)

Articles Stored	Width	Depth
Cleaning supplies and equipment	17	14
" " " " and ironing board	19	16
Cleaning supplies, ironing board, and step ladder	25	21
Cleaning supplies, ironing board, step ladder and 3 table leaves	29	21

The sizes included in these tables are presented as minimum desirable standards from the point of view of producing a work shop of desirable efficiency. When money is too limited to provide for the specified amounts of working and storage space and equipment, space should be allowed in the kitchen planned for long time occupancy so equipment may be added when the budget permits.

For emergency and short time use or for families living on a mere subsistence basis it is possible, of course, to get along with less equipment than is designated. But it should be recognized that wherever lower standards call for excessive expenditure of time and labor on the part of the homemaker or result in poorer meals, the health and welfare of the family and thereby of the nation suffers.



